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Morris Trainor, Zoe; Jong, Jonathan; Bluemke, Matthias; Halberstadt, Jamin

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Death Salience Moderates the Effect of Trauma on Religiosity

Zoe Morris Trainor
University of Otago

Jonathan Jong
Coventry University and Oxford University

Matthias Bluemke
GESIS–Leibniz Institute for the Social Sciences

Jamin Halberstadt
University of Otago

Objective: Previous research has shown contradictory evidence for the relationship between religiosity and trauma; exposure to traumatic life events has been associated with both increases and decreases in religiosity over time. On the basis of a long theoretical tradition of linking death and religious belief and recent empirical evidence that thoughts of death may increase religiosity, we tested whether one determinant of trauma's influence on religion is the degree to which it makes death salient. ***Method:*** Using longitudinal data from the Dunedin Multidisciplinary Health and Development Study, a unique population-representative birth cohort, we tested whether the relationship between trauma and religiosity depends on whether the trauma involves death. Participants reported their private, ceremonial, and public religious behaviors at ages 26 and 32 and, at age 32, whether they had experienced any of 23 traumatic life events since age 26. ***Results:*** Experiencing the death of a loved one (but not an equally traumatic event not involving death) predicted a future increase in private religious behavior (e.g., prayer) among those already practicing such behaviors, and an increase in the importance of religious ceremonies among those with relatively little prior interest in them. On the other hand, experiencing a death-unrelated trauma predicted a future reduction in public displays of religiosity among those previously so inclined. ***Conclusion:*** The study represents a significant step in understanding religious responses to trauma, and emphasizes the importance of considering not only the nature of a trauma, but also the dimensions and practices of a victim's religiosity prior to it.

Clinical Impact Statement
Why, when personal tragedy strikes, do some people seek solace in religion, but others do not? Our longitudinal study shows that part of the answer involves whether a traumatic event involves death. People who experienced the death of a loved one reported more frequent prayer, and attributed greater importance to religious ceremonies, but people who experienced an equally (death-unrelated) traumatic event reduced their church attendance. The results suggest that clinicians should take account of the death-relatedness of a trauma, as well the dimensions and practices of a victim's religiosity prior to it, when predicting the value of religious coping strategies.

Keywords: trauma, religion, religiosity, death, death anxiety, life events
Supplemental materials: http://dx.doi.org/10.1037/tra0000430.supp

Correlational evidence suggests a connection between negative life experiences and changes in religious belief and behavior (see Ben-Ezra et al., 2010; Brown, Nesse, House, & Utz, 2004; Fontana & Rosenheck, 2004; Walker, Reid, O'Neill, & Brown, 2009). The nature of this relationship, however, is uncertain and results are inconsistent (Smith, 2004; ter Kuile & Ehring, 2014). In some cases, adversities appear to be associated with a lessening of religious beliefs and practices among their victims (Ben-Ezra et al., 2010; Bierman, 2005; Fontana & Rosenheck, 2004; Krause & Hayward, 2012; Walker et al., 2009), whereas in other cases religiosity seems to increase with exposure to negative life experiences (Aydin, Fischer, & Frey, 2010; Brown et al., 2004; Carmil & Breznitz, 1991; Siegel & Schrimshaw, 2000; Ullman, 1982; Walker et al., 2009). Moreover, both effects are equally explicable: on one hand, a trauma victim could turn to God as a source of comfort (e.g., Atran, 2002); on the other hand, she might see her misfortunes as evidence of God's absence or indifference, and thus

Zoe Morris Trainor, Department of Psychology, University of Otago; Jonathan Jong, Centre for Advances in Behavioural Science, Coventry University, and Institute for Cognitive and Evolutionary Anthropology, University of Oxford; Matthias Bluemke, Survey Design and Methodology, GESIS–Leibniz Institute for the Social Sciences; Jamin Halberstadt, Department of Psychology, University of Otago.

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Correspondence concerning this article should be addressed to Jamin Halberstadt, Department of Psychology, University of Otago, P.O. Box 56, Dunedin, New Zealand 9082. E-mail: jhalbers@psy.otago.ac.nz

question or reject religious faith (e.g., Exline, Park, Smyth, & Carey, 2011).

Given this theoretical and evidential ambiguity, it is likely that the effect of traumatic life events on religiosity is positive in some contexts and negative in others. Yet, to our knowledge, no research to date has examined what factors influence the direction of change in religiosity following trauma, representing a significant gap in the literature (Falsetti, Resick, & Davis, 2003; ter Kuile & Ehring, 2014). The present research therefore examines a plausible moderator of the trauma–religiosity relationship: the extent to which a traumatic event makes death salient.

As many theorists have observed, religious beliefs and behaviors often revolve around death (e.g., Atran, 2002; Jong & Halberstadt, 2016; Rossano, 2013), from the cross-cultural preponderance of mortuary rituals to the ubiquity of afterlife beliefs. Although they vary in content, religious belief systems very often contain strong themes regarding death and the afterlife, and strive to explain death's significance and implications. A reasonable assumption, therefore, is that people's understanding of death will be strongly sculpted by their culture's dominant religious framework, and that—regardless of their prior religious inclinations—they may turn to that framework when a traumatic event forces them to confront the idea of their death head on. Alternatively, religious beliefs and themes may be only or primarily comforting when people already hold a religious worldview.

A number of theories, both historical and contemporary, are consistent with the hypothesis that death salience plays a role in religious belief (Becker, 1973; Vail et al., 2010; see Jong & Halberstadt, 2016 for review). Terror management theory (TMT), in particular, posits that humans are, perhaps uniquely, aware of their mortality, creating the potential for crippling anxiety. We avoid this state, according to TMT, by seeking symbolic and/or literal immortality. In this context, religion should provide a particularly effective buffer, as adherents not only achieve symbolic immortality by virtue of their membership in a collective and enduring institution (e.g., their church), but also literal immortality via an afterlife that transcends bodily death (Becker, 1973; Solomon, Greenberg, & Pyszczynski, 2015; Vail et al., 2010).

Some recent experimental studies have found support for the causal link between death anxiety and religious belief, though their number is surprisingly small (see Jong & Halberstadt, 2016, for a full review). Norenzayan and Hansen (2006), for example, found that participants who were asked to imagine and describe their own death subsequently reported greater religious affiliation and stronger belief in "God/a higher power" compared with control participants who described a neutral situation. Vail, Arndt, and Abdollahi (2012), however, found that death-priming increased belief only in participants' preferred deity (Jesus, in this case) and decreased belief in others' deities (atheists were not affected by the manipulation), suggesting that participants were bolstering their worldviews rather than increasing their religiosity, per se. Jong, Halberstadt, and Bluemke (2012) found evidence for both worldview bolstering and increased religiosity following death priming. Self-identified religious participants more strongly endorsed religious propositions when their mortality was salient (compared with controls), whereas nonreligious participants showed the opposite effect. In a second study, however, all death-primed participants, regardless of prior beliefs, were faster to associate religious concepts with synonyms of "real" (an implicit measure of belief). Analogously, taking a longitudinal view, life events that bring mortality to mind might predict a person's future religious trajectory: Traumas in which someone dies should increase religious belief to a greater extent than other, equally traumatic, events that do not involve death, at least for those inclined toward a religious worldview.

The present study provides the first test of death salience as a moderator of the trauma–religiosity relationship. Data were obtained from a sample of young adults who were part of a unique, population-representative, 45-year longitudinal study of health and behavior within a single birth cohort from Dunedin, New Zealand. Participants' religiosity was measured twice, at age 26 and age 32, on several behavioral dimensions. In the intervening years the participants experienced a variety of naturally occurring traumatic events, some involving the death of loved ones, as well as other, equally traumatic events that did not involve death (e.g., loss of partner because of divorce, serious illness). We hypothesized that changes in religiosity would depend on the extent to which participants experienced death-related, but not death-unrelated traumas. Participants' religiosity at age 26 was included as an additional factor, as both existing theory (Vail et al., 2010), and our own previous laboratory research (Jong et al., 2012), suggest that death-driven religiosity may depend on preexisting religious belief, at least when measured by explicit (rather than implicit) means.

Method

Participants

The present study used data from the Dunedin Multidisciplinary Health and Development Study (hereafter referred to as the *Dunedin Study*), a longitudinal study of health and behavior in a population-representative birth cohort and the basis for over 1,200 research articles (Poulton, Moffitt, & Silva, 2015). The Dunedin Study's initial sample included 1,037 members (502 female, 535 male). To be included in the Dunedin Study, participants had to be born at Queen Mary Maternity Hospital (the only maternity hospital in Dunedin at the time) between April 1, 1972 and March 31, 1973 and still be living in the greater Dunedin metropolitan area three years later. The first assessment was carried out at age 3, then again at ages 5, 7, 9, 11, 13, 15, 18, 21, 26, 32, and 38 years. The present study used all the data from phase 26 and 32 (the only two points including directly comparable religiosity items), at which point 96% of the surviving participants remained in the study. The sample was representative of socioeconomic and ethnic status in New Zealand's South Island in the 1970s. The 9% of families that originally declined to participate in the study were not demographically different from those who agreed to participate in terms of maternal prenatal complications, birth weights, neonatal complications, or family socioeconomic status. At age 26, approximately half of the participants (50.6%) identified as nonreligious ("no religion"), and 36.3% identified as religious (62.8% Protestant/Christian, 27.4% Catholic, 9.8% other). The remaining 13.1% said they "don't know" or left the item blank and are not included in analyses involving religious identity.

Procedure

The Dunedin Study's research protocol involves bringing study members into the research unit for an 8-hr day of assessment, comprising multiple interviews and tests administered by different interviewers in counterbalanced order throughout the day. Informed consent from participants and approval by the Otago Ethics Committee were gained for each phase of the study. The Director of the Dunedin Study, Professor Richie Poulton, reviewed and approved the present study and granted access to the data.

Measures

Nine questions adapted from the Wisconsin Longitudinal Study (Herd, Carr, & Roan, 2014) were used to measure religiosity at ages 26 and 32. Questions referred to the frequency of religious behaviors (e.g., "How often do you attend a religious or spiritual service?") and the importance of religion and religious ceremonies (e.g., "How important is religion or spirituality to you?"; see the Results section for all items). Participants' responses were coded on three-point scales: 0 (*seldom or never/not important*), 1 (*somewhat often/important*), or 2 (*very often/important*), alternatively coded as 7 (*do not know*) and not analyzed as part of the scale.

A questionnaire administered at age 32 was used to measure which of 23 traumatic life events participants experienced between ages 26 and 32. The scale is an adapted version of the Social Readjustment Rating Scale (Holmes & Rahe, 1967) and its questions covered a range of stressful and traumatic experiences that an individual could experience during adulthood (e.g., divorce, death of a parent, major loss of income etc.). Interviewers coded the participants' responses on a binary scale: 0 (no) or 1 (yes), alternatively coded as 7 (*do not know*) and not analyzed as part of the scale. A fuller description of the measure is provided in the online supplemental material.

Statistical Analyses

We used SPSS Versions 23 and 24 for data preparation, descriptives, and exploratory factor analysis and Mplus 7.31 for confirmatory factor analysis. To overcome estimation problems of complex latent variable regression analysis (including moderators) on top of confirmatory factor analysis in Mplus, factor scores represented the religiosity variables of interest, estimated by Mplus in the strict measurement invariance model (see the online supplemental material for details).

Results

Dependent Variables

"Do not know" and missing responses constituted 7.1% and 7.2% of the religiosity and trauma data, respectively, and were not included in the initial exploratory factor analyses, but handled with full information maximum likelihood in subsequent confirmatory factor analyses. The nine religiosity items answered at age 26 were subjected to a principal axis factor analysis, both with varimax rotation and oblique rotation, which suggested three factors, explaining 77.5% of the variance. (When run on the religiosity items at age 32, a highly similar three-factor structure resulted, accounting for 77.3% of the variance.) The first factor, which we termed *private religiosity* (Boswell & Boswell-Ford, 2010; Bosworth, Park, McQuoid, Hays, & Steffens, 2003; Koenig et al., 1997) included four items: "How important is religion or spirituality to you?"; "How often do you get comfort and strength from religion or spirituality?"; "How often do you take some moments of prayer, mediation or contemplation or something like that, outside of scheduled services?"; and "How often do you read the bible or other spiritual of religious material?" The second factor was termed *ceremonial religiosity* and included three items: "How important do you think it is to hold a religious or spiritual service for the birth of a new child [marriage] [death]?". We termed the third factor *public religiosity* (Boswell & Boswell-Ford, 2010; Bosworth et al., 2003; Koenig et al., 1997), including the following: "How often do you attend a religious or spiritual service?" and "How often do you make financial contributions to a church, temple, synagogue, or other religious or spiritual group?"

The apparent three-correlated-factor solution was inspected for model fit in a confirmatory factor analysis. We specified the dominant item-factor relationships while not allowing for any cross-loadings. Using robust maximum likelihood to account for nonnormality of the data, model fit indices suggested that this three-correlated-factor model fitted well; it also fitted better than alternatively tested one- or two-factorial solutions (see the online supplemental material). The three factors conform to a theoretically meaningful, and statistically viable, measurement model that predominantly reflects three interrelated aspects of private and public religiosity, with ceremonial religiosity forming a third overlapping but distinct construct. The three-correlated factor model was replicated with responses at age 32, with good model fit (see the online supplemental material).

Longitudinal Measurement Invariance

Interest in longitudinal changes in religiosity as a function of life events requires that the same latent variables be assessed across time. Only if the constructs are measured in a comparable way, are (latent) change scores meaningful. A series of measurement invariance models that accounted for nonindependent indicators across time (Bluemke, Jong, Grevenstein, Miklousić, & Halberstadt, 2016; Geiser, 2013) supported the assumption of strict measurement invariance: According to the usual heuristics (Cheung & Rensvold, 2002; Meade, Johnson, & Braddy, 2008), when we increasingly constrained model parameters to equality at the configural level (equal item-factor relationships), metric level (equal factor loadings), scalar level (equal intercepts), and residual level (equal error variances), we did not observe substantial model misfit (see the online supplemental material for details). The final (strict) invariance model—a model that simultaneously constrains factor structure, factor loadings, item intercepts, and residual variances to equality across time points—had good model fit, $\chi^2(132) = 483.10$, $p < .001$, $\chi^2/df = 3.66$, CFI = .95, RMSEA = .053, 90% CI [.048–.059], SRMR = .052. As a consequence, the item loadings, intercepts, and residual variances, which appear in full in the online supplemental material, can be estimated at age 26 and simultaneously applied to the corresponding items at age 32, so that two sets of latent variables (factor scores) with identical statistical parameters and conceptual meaning result—a prerequisite for estimating true change across time. Though the correlations between latent variables supported the notion of interindividual stability

of religiosity across time (ρ = .54–.75; see Table 1), their deviations from unity do not reflect measurement error, but point to changes in individuals' positions in the true score distributions.

Predictor Variables

As an overall measure of the extent to which participants had suffered traumatic experiences in the 6 years between testing, we calculated the total number of "yes" responses to the 23 items in the traumatic events questionnaire. A normal but slightly right skewed distribution resulted, with participants experiencing an average of 3.8 traumas (*SD* = 2.2; see Figure 1).

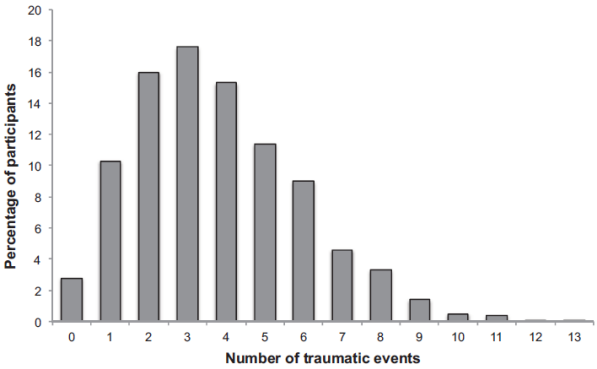

Figure 1. Distribution of traumatic events experienced by participants between age 26 and 32.

To test the specific hypothesis that death-related traumas would be associated with increased religiosity over time more than would equally traumatic events unrelated to death, we created two trauma variables. "Death-related traumas" included all four items involving death: death of partner/spouse; death of a child; death of a parent or sibling; and death of a close friend. "Death-unrelated traumas" included four comparable events—divorce; separation from partner/spouse due to work or relationship difficulties; serious illness or injury; and being held in jail—that are equivalent in terms of the distress they cause (Paykel, Prusoff, & Uhlenhuth, 1971), the intensity and length of time needed to adjust to them (Holmes & Rahe, 1967), and the amount of "turmoil, disruption, and upheaval" they cause (Cochrane & Robertson, 1973, p. 135). Two scores were computed by summing the number of "Yes" responses to each type of trauma. More information justifying the equivalence of the two types of traumas can be found in the online supplemental material.

An initial analysis revealed that the modal score on both measures was zero: 59.1% and 53.7% of participants experienced no death-related or death-unrelated trauma, respectively, between the ages of 26 and 32, and only 2.9% and 7.5% experienced more than one. In light of these distributions, participants' responses were recoded based on whether or not they had experienced any of the target traumas. This created two dichotomous variables, one indicating whether or not the participant had experienced a death-related trauma (usually one) since age 26, and the other indicating whether or not they had experienced a death-unrelated trauma (usually one) since age 26. A McNemar's test showed a very small (r = .05) but statistically significant relationship between the two measures, $\chi^2(1) = 7.19$, p = .008, such that participants who had experienced a death-related trauma were slightly more likely than those who had not (34% vs. 39%) to have experienced a death-unrelated trauma.

Table 1
Latent Variable Correlations in Strictly Invariant Longitudinal Measurement Model

Variable	1	2	3	4	5	6
1. Private (age 26)	—					
2. Ceremonial (age 26)	.47	—				
3. Public (age 26)	.73	.43	—			
4. Private (age 32)	*.75*	.40	.59	—		
5. Ceremonial (age 32)	.41	*.54*	.35	.54	—	
6. Public (age 32)	.58	.36	*.67*	.73	.46	—

Note. Test–retest correlations from age 26 to age 32 are displayed in italic type.

Age 32 Religiosity as a Function of Life Events

We analyzed each dimension of religiosity (private, ceremonial, and public) in a separate regression model, using Hayes' (2013) PROCESS macro for SPSS (Model 2). In each case, age 32 religiosity on one dimension was entered as the dependent variables, age 26 religiosity on that dimension, death-related trauma and death-unrelated trauma (dummy coded) and both Trauma × Age 26 religiosity interactions were included as predictors, and age 26 religiosity on the other two dimensions were treated as covariates. Note that because factor analysis produces scaled scores, akin to standardized variables (M = 0 and var = SD = 1), religiosity data are automatically centered for the analysis, whereas the majority (~68%) of predicted scores vary from -1 to +1.

Key main effects and interactions appear in Table 2 and are plotted in Figure 2. As seen in the Table and Figure, traumatic events predicted changes in all three dimensions of religiosity, but in a different way for each dimension. Participants who lived through the death of a close other reported greater private and ceremonial religiosity, although the latter effect was moderated by their religiosity prior to the trauma: religious ceremonies were more important posttrauma to the extent that participants were less religious beforehand. A Johnson-Neyman test indicated that the effect of death traumas on posttrauma ceremonial religiosity was significant for pretrauma religiosity less than -.13 (approximately 42% of participants). In contrast, for public religiosity, it was death-unrelated trauma that, depending on pretrauma religiosity, predicted change, such that the effect of trauma was more positive at higher levels of pretrauma public religiosity. A Johnson-Neyman test indicated that the effect of death-unrelated traumas on posttrauma public religiosity was significant for pretrauma religiosity greater than 0.57 (approximately 15% of participants).

Discussion

Previous research has shown contradictory evidence for the relationship between religiosity and trauma; apparently, exposure to traumatic life events can predict either an increase or a decrease in a person's religiosity over time. On the basis of a long theoretical tradition of linking death and religious belief (see Jong & Halberstadt, 2016, for review), and recent empirical evidence that

Table 2
Regression of Religiosity Domains on Binary Coding of the Presence of Traumatic Events

Regression model	β	*SE*	*t*	*p*	LL-CI	UL-CI
Age 32 private religiosity						
Age 26 private religiosity	.77	.04	17.26	<.001	.68	.85
Death-related trauma	.08	.042	2.00	.045	.002	.16
Death-unrelated trauma	.01	.040	.21	.84	-.07	.09
Age 26 × Death-Related Trauma	.07	.04	1.56	.12	-.02	.15
Age 26 × Death-Unrelated Trauma	-.02	.04	-.44	.66	-.10	.06
Age 32 ceremonial religiosity						
Age 26 ceremonial religiosity	.52	.04	12.82	<.001	.44	.60
Death-related trauma	.08	.05	1.66	.10	-.01	.18
Death-unrelated trauma	.03	.05	.60	.55	-.07	.12
Age 26 Ceremonial Religiosity × Death-Related Trauma	-.12	.05	-2.30	.02	-.23	-.02
Age 26 Ceremonial Religiosity × Death-Unrelated Trauma	-.02	.05	-.40	.69	-.12	.08
Age 32 public religiosity						
Age 26 public religiosity	.73	.05	14.89	<.001	.63	.82
Death-related trauma	.02	.04	.55	.58	-.06	.11
Death-unrelated trauma	-.02	.04	-.52	.60	-.11	.06
Age 26 Public Religiosity × Death-Related Trauma	-.08	.05	-1.66	.10	-.17	.01
Age 26 Public Religiosity × Death-Unrelated Trauma	-.14	.05	-2.87	.004	-.23	-.04

Note. LL-CI = lower level confidence interval; UL-CI = upper level confidence interval.

thoughts of death may increase religiosity (Jong et al., 2012), we proposed that one determinant of trauma's influence on religion is the degree to which it makes death salient. This hypothesis was tested in a unique birth cohort whose religious behaviors and comprehensive history of trauma were available over a period of 6 years. We predicted that participants would show increased religiosity if and only if they experienced one or more of four traumas involving the death of friends or family, and not if they experienced one or more of four matched events, which were equally traumatic but did not directly involve death.

The results partially confirmed our hypotheses, but also revealed some interesting unexpected effects. Indeed, the two types of trauma—death-related and death-unrelated—influenced each dimension of religiosity differently. Participants reported greater private and ceremonial religiosity at age 32 (the former, marginally) if they had suffered a death-related trauma in the previous six years, but not if they had suffered a death-unrelated trauma during that time. These results are consistent with theories that assume (Greenberg, Solomon, & Pyszczynski, 1997), and with some empirical research that finds (Jong et al., 2012), that individuals seek solace in religious beliefs as a response to death anxiety, and they provide the first direct evidence in the field that death-salience moderates individuals' religious responses to trauma. Importantly, however, the effect of death traumatization depended on participants' religiosity prior to the trauma (i.e., at age 26), and in opposite ways: death traumas tended to have bigger effects among those relatively high in private religiosity, and, independently, among those relatively low in ceremonial religiosity. Meanwhile, public religiosity showed yet a third pattern, with death-unrelated traumas decreasing church attendance and donation among participants inclined toward these behaviors prior to their traumas. Put another way, experiencing the death of a close other (but not an equally traumatic event not involving death) increased private religious behavior, such as prayer and bible study, among those practicing such behaviors, and increased the importance of religious ceremonies among those with relatively little prior interest in them. On the other hand, experiencing a death-unrelated trauma reduced public displays of religiosity among those previously so inclined.

Although these effects represent an important first step in understanding the obviously complex relationship between trauma and religiosity, we are unable (and the current study was not intended) to determine the mechanisms underlying them. Indeed, there are several reasons to exercise caution when interpreting and extrapolating the results. First, the current findings are limited to three dimensions of religious behavior, but as we have argued in depth elsewhere (Jong & Halberstadt, 2016), "religiosity" (and, for that matter, "death anxiety") is a multifaceted construct, involving beliefs, emotions, behaviors, and values (among other components), and researchers conflate these distinctions at their peril. Indeed, the closest laboratory analogue to the current study, Jong et al. (2012), used a measure of *religious belief*, defined as the acceptance of religious propositions (e.g., that God exists) as true. Religious belief does not necessarily have the same etiology, consequences, or functions as behavior, although the two may be causally related.

Furthermore, the three dimensions of religious behavior—private, ceremonial, and public—may reflect different religious orientations or motivations for being religious. For example, previous research has associated public religious behaviors with extrinsic religiosity (i.e., religiosity for the sake of social, practical, or emotional benefit) and private religious behaviors with intrinsic religiosity (i.e., religiosity for its own sake, or from sincere belief; Maltby, Talley, Cooper, & Leslie, 1995). The measure of ceremonial religiosity used in this study is ambiguous in this taxonomy, as it refers to public events, but emphasizes their importance to the individual. Previous research indicates that religious orientations do predict coping styles and outcomes, but no work has examined the effects of trauma on religious orientation itself (Palmer & Sebby, 2003; Park, Cohen, & Herb, 1990).

Future research should also take account of the distinction between implicit and explicit measurement. Jong et al. (2012) found that mortality salience uniformly increased religious belief only when belief was measured implicitly (via a single target

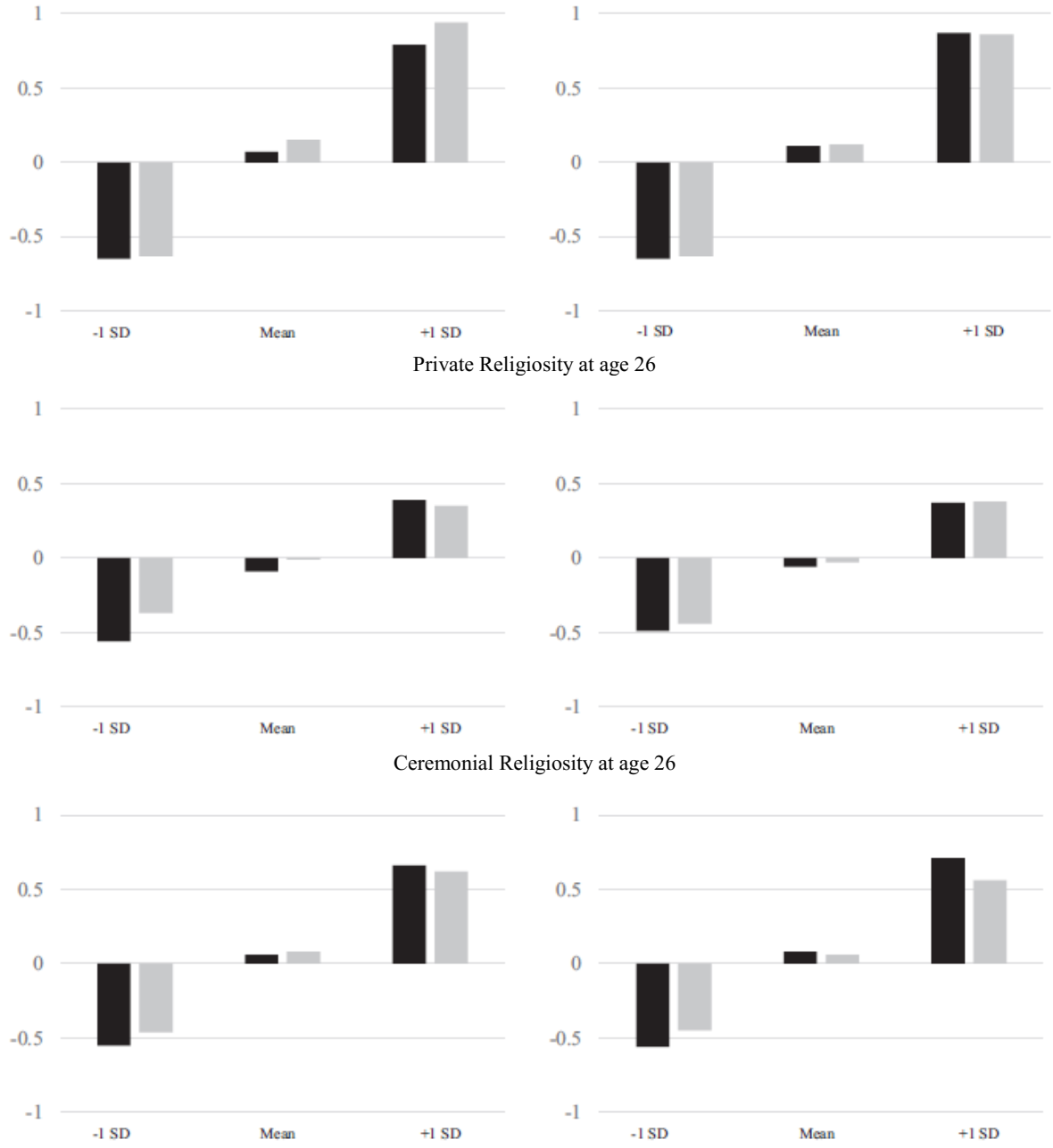

Figure 2. Estimated age 32 private, ceremonial, and public religiosity factor scores as a function of absence versus presence of trauma (represented by black and gray bars, respectively), type of trauma (death related or unrelated, in the left and right columns, respectively) and age 26 religiosity (displayed at the mean and ± 1 *SD*).

implicit association test). When (in a different study) religious belief was measured explicitly (via the Supernatural Belief Scale; Jong, Bluemke, & Halberstadt, 2013), the effect of mortality salience depended on participants' religious identity: participants who identified as Christian reported stronger religious belief in the death priming (vs. control) condition, but participants who identified as nonreligious reported weaker religious belief. These explicit data are consistent with terror management theory's "worldview defense" mechanism, in which individuals protect against death anxiety by bolstering core belief systems, regardless of their particular content or implications for literal immortality. Given their reliance on explicit self-reports of religious behavior, and the revealed interactions with pretrauma religiosity, the current results may in part be understood in light of these distinctions. As in Jong et al. (2013), private religiosity increased more among participants already high on this measure, consistent with a worldview-defense response to death trauma. On the other hand, ceremonial and public religiosity showed the opposite interaction, with trauma reducing religiosity among the upper end of pretrauma religiosity (worldview desertion?). One of the key insights of the current research, then, is that the question motivating it—how does trauma influence religiosity—is too simple: effects appear to vary not only with the type of trauma and prior religiosity, but also with how religiosity is practiced and expressed. Indeed, a fascinating possibility is that individuals strategically adjust the facets of their religious beliefs and behaviors when faced with traumas and challenges, for example sacrificing public displays to focus on private belief systems.

Although all the effects in the current study are quite small (consistent with other reports of increased religiosity following trauma; e.g., Aydin et al., 2010; Brown et al., 2004; Carmil & Breznitz, 1991; Sibley & Bulbulia, 2012), with none explaining more than about one percent of the variance in religious belief at age 32, we believe them to be conservative estimates. Although religiosity changes across the life span, it does not do so consistently, and research has found young to middle adulthood to be a period of relative stability (Hayward & Krause, 2013; Koenig, McGue, & Iacono, 2008). It is also a period of relative calm in terms of deaths of loved ones, with the chance of experiencing such an event likely to increase in the next two decades of life (Breslau et al., 1998). As our participants age, however, the variance in their experiences should increase, providing better opportunities to explore the complex relationships among trauma and religiosity uncovered here. Future research might also profitably draw a sharper distinction between death-related and death-unrelated traumas. We only included in the former category events in which a death actually occurred, and had no way to know the extent to which other events (e.g., illness) might have made death more or less salient. Classification in terms of participants' idiosyncratic posttraumatic death-related cognitions would add considerable power to test more nuanced hypotheses.

In the current study, however, these limitations are outweighed by ecological validity and sampling rigor. An entire birth cohort for a large and representative western city reported religious behavior before and after suffering life's natural misfortunes. How those misfortunes affected their religiosity six years later depended not only on whether they involved death (as we initially hypothesized), but also on the participants' religiosity prior to the trauma, and the aspect of religiosity being measured. The results represent only a snapshot of one population at a particular phase of life, but they provide initial answers to the vexing questions of when people turn to religion following traumatic events.

References

Atran, S. (2002). *In gods we trust: The evolutionary landscape of religion*. New York, NY: Oxford University Press.

Aydin, N., Fischer, P., & Frey, D. (2010). Turning to God in the face of ostracism: Effects of social exclusion on religiousness. *Personality and Social Psychology Bulletin, 36,* 742–753. http://dx.doi.org/10.1177/0146167210367491

Becker, E. (1973). *The denial of death*. New York, NY: Simon & Schuster.

Ben-Ezra, M., Palgi, Y., Sternberg, D., Berkley, D., Eldar, H., Glidai, Y., . . . Shrira, A. (2010). Losing my religion: A preliminary study of changes in belief pattern after sexual assault. *Traumatology, 16,* 7–13. http://dx.doi.org/10.1177/1534765609358465

Bierman, A. (2005). The effects of childhood maltreatment on adult religiosity and spirituality: Rejecting god the father because of abusive fathers? *Journal for the Scientific Study of Religion, 44,* 349–359. http://dx.doi.org/10.1111/j.1468-5906.2005.00290.x

Bluemke, M., Jong, J., Grevenstein, D., Mikloušić, I., & Halberstadt, J. (2016). Measuring cross-cultural supernatural beliefs with self- and peer-reports. *PLoS ONE, 11*(10), e0164291. http://dx.doi.org/10.1371/journal.pone.0164291

Boswell, G. E., & Boswell-Ford, K. C. (2010). Testing a SEM model of two religious concepts and experiential spirituality. *Journal of Religion and Health, 49,* 200–211. http://dx.doi.org/10.1007/s10943-009-9254-x

Bosworth, H. B., Park, K. S., McQuoid, D. R., Hays, J. C., & Steffens, D. C. (2003). The impact of religious practice and religious coping on geriatric depression. *International Journal of Geriatric Psychiatry, 18,* 905–914. http://dx.doi.org/10.1002/gps.945

Breslau, N., Kessler, R. C., Chilcoat, H. D., Schultz, L. R., Davis, G. C., & Andreski, P. (1998). Trauma and posttraumatic stress disorder in the community: The 1996 Detroit Area Survey of Trauma. *Archives of General Psychiatry, 55,* 626–632. http://dx.doi.org/10.1001/archpsyc.55.7.626

Brown, S. L., Nesse, R. M., House, J. S., & Utz, R. L. (2004). Religion and emotional compensation: Results from a prospective study of widowhood. *Personality and Social Psychology Bulletin, 30,* 1165–1174. http://dx.doi.org/10.1177/0146167204263752

Carmil, D., & Breznitz, S. (1991). Personal trauma and world view: Are extremely stressful experiences related to political attitudes, religious beliefs, and future orientation? *Journal of Traumatic Stress, 4,* 393–405. http://dx.doi.org/10.1002/jts.2490040307

Cheung, G. W., & Rensvold, R. B. (2002). Evaluating goodness-of-fit indexes for testing measurement invariance. *Structural Equation Modeling, 9,* 233–255. http://dx.doi.org/10.1207/S15328007SEM0902_5

Cochrane, R., & Robertson, A. (1973). The life events inventory: A measure of the relative severity of psycho-social stressors. *Journal of Psychosomatic Research, 17,* 135–140. http://dx.doi.org/10.1016/0022-3999(73)90014-7

Exline, J. J., Park, C. L., Smyth, J. M., & Carey, M. P. (2011). Anger toward God: Social-cognitive predictors, prevalence, and links with adjustment to bereavement and cancer. *Journal of Personality and Social Psychology, 100,* 129–148. http://dx.doi.org/10.1037/a0021716

Falsetti, S. A., Resick, P. A., & Davis, J. L. (2003). Changes in religious beliefs following trauma. *Journal of Traumatic Stress, 16,* 391–398. http://dx.doi.org/10.1023/A:1024422220163

Fontana, A., & Rosenheck, R. (2004). Trauma, change in strength of religious faith, and mental health service use among veterans treated for PTSD. *Journal of Nervous and Mental Disease, 192,* 579–584. http://dx.doi.org/10.1097/01.nmd.0000138224.17375.55

Geiser, C. (2013). *Data analysis with Mplus*. New York, NY: Guilford Press.

Greenberg, J., Solomon, S., & Pyszczynski, T. (1997). Terror management theory of self-esteem and cultural worldviews. *Advances in Experimental Social Psychology, 29,* 61–139. http://dx.doi.org/10.1016/S0065-2601(08)60016-7

Hayes, A. F. (2013). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach*. New York, NY: Guilford Press.

Hayward, R. D., & Krause, N. (2013). Patterns of change in religious service attendance across the life course: Evidence from a 34-year longitudinal study. *Social Science Research, 42,* 1480–1489. http://dx.doi.org/10.1016/j.ssresearch.2013.06.010

Herd, P., Carr, D., & Roan, C. (2014). Cohort profile: Wisconsin Longitudinal Study (WLS). *International Journal of Epidemiology, 43,* 34–41. http://dx.doi.org/10.1093/ije/dys194

Holmes, T. H., & Rahe, R. H. (1967). The social readjustment rating scale. *Journal of Psychosomatic Research, 11,* 213–218. http://dx.doi.org/10.1016/0022-3999(67)90010-4

Jong, J., Bluemke, M., & Halberstadt, J. (2013). Fear of death and supernatural beliefs: Developing a new Supernatural Belief Scale to test the relationship. *European Journal of Personality, 27,* 495–506.

Jong, J., & Halberstadt, J. (2016). *Death anxiety and religious belief: An existential psychology of religion*. London, UK: Bloomsbury Publishing.

Jong, J., Halberstadt, J., & Bluemke, M. (2012). Foxhole atheism, revisited: The effects of mortality salience on explicit and implicit religious belief. *Journal of Experimental Social Psychology, 48,* 983–989. http://dx.doi.org/10.1016/j.jesp.2012.03.005

Koenig, H. G., Hays, J. C., George, L. K., Blazer, D. G., Larson, D. B., & Landerman, L. R. (1997). Modeling the cross-sectional relationships between religion, physical health, social support, and depressive symptoms. *The American Journal of Geriatric Psychiatry, 5,* 131–144. http://dx.doi.org/10.1097/00019442-199721520-00006

Koenig, L. B., McGue, M., & Iacono, W. G. (2008). Stability and change in religiousness during emerging adulthood. *Developmental Psychology, 44,* 532–543. http://dx.doi.org/10.1037/0012-1649.44.2.532

Krause, N., & Hayward, R. D. (2012). Humility, lifetime trauma, and change in religious doubt among older adults. *Journal of Religion and Health, 51,* 1002–1016. http://dx.doi.org/10.1007/s10943-012-9576-y

Maltby, J., Talley, M., Cooper, C., & Leslie, J. C. (1995). Personality effects in personal and public orientations toward religion. *Personality and Individual Differences, 19,* 157–163. http://dx.doi.org/10.1016/0191-8869(95)00036-6

Meade, A. W., Johnson, E. C., & Braddy, P. W. (2008). Power and sensitivity of alternative fit indices in tests of measurement invariance. *Journal of Applied Psychology, 93,* 568–592. http://dx.doi.org/10.1037/0021-9010.93.3.568

Norenzayan, A., & Hansen, I. G. (2006). Belief in supernatural agents in the face of death. *Personality and Social Psychology Bulletin, 32,* 174–187. http://dx.doi.org/10.1177/0146167205280251

Palmer, J. B., & Sebby, R. A. (2003). Intrinsic-extrinsic religious orientation and individual coping style. *Psychological Reports, 93,* 395–398. http://dx.doi.org/10.2466/pr0.2003.93.2.395

Park, C., Cohen, L. H., & Herb, L. (1990). Intrinsic religiousness and religious coping as life stress moderators for Catholics versus Protestants. *Journal of Personality and Social Psychology, 59,* 562–574. http://dx.doi.org/10.1037/0022-3514.59.3.562

Paykel, E. S., Prusoff, B. A., & Uhlenhuth, E. H. (1971). Scaling of life events. *Archives of General Psychiatry, 25,* 340–347. http://dx.doi.org/10.1001/archpsyc.1971.01750160052010

Poulton, R., Moffitt, T. E., & Silva, P. A. (2015). The Dunedin Multidisciplinary Health and Development Study: Overview of the first 40 years, with an eye to the future. *Social Psychiatry and Psychiatric Epidemiology, 50,* 679–693. http://dx.doi.org/10.1007/s00127-015-1048-8

Rossano, M. J. (2013). *Mortal rituals: What the story of the Andes survivors tells us about human evolution*. New York, NY: Columbia University Press.

Sibley, C. G., & Bulbulia, J. (2012). Faith after an earthquake: A longitudinal study of religion and perceived health before and after the 2011 Christchurch New Zealand Earthquake. *PLoS ONE, 7*(12), e49648. http://dx.doi.org/10.1371/journal.pone.0049648

Siegel, K., & Schrimshaw, E. W. (2000). Perceiving benefits in adversity: Stress-related growth in women living with HIV/AIDS. *Social Science & Medicine, 51,* 1543–1554. http://dx.doi.org/10.1016/S0277-9536(00)00144-1

Smith, S. (2004). Exploring the interaction of trauma and spirituality. *Traumatology, 10,* 231–243. http://dx.doi.org/10.1177/153476560401000403

Solomon, S., Greenberg, J., & Pyszczynski, T. (2015). *The worm at the core: On the role of death in life*. London, UK: Allen Lane.

ter Kuile, H., & Ehring, T. (2014). Predictors of changes in religiosity after trauma: Trauma, religiosity, and posttraumatic stress disorder. *Psychological Trauma: Theory, Research, Practice, and Policy, 6,* 353–360. http://dx.doi.org/10.1037/a0034880

Ullman, C. (1982). Cognitive and emotional antecedents of religious conversion. *Journal of Personality and Social Psychology, 43,* 183–192. http://dx.doi.org/10.1037/0022-3514.43.1.183

Vail, K. E., III, Arndt, J., & Abdollahi, A. (2012). Exploring the existential function of religion and supernatural agent beliefs among Christians, Muslims, atheists, and agnostics. *Personality and Social Psychology Bulletin, 38,* 1288–1300. http://dx.doi.org/10.1177/0146167212449361

Vail, K. E., III, Rothschild, Z. K., Weise, D. R., Solomon, S., Pyszczynski, T., & Greenberg, J. (2010). A terror management analysis of the psychological functions of religion. *Personality and Social Psychology Review, 14,* 84–94. http://dx.doi.org/10.1177/1088868309351165

Walker, D. F., Reid, H. W., O'Neill, T., & Brown, L. (2009). Changes in personal religion/spirituality during and after childhood abuse: A review and synthesis. *Psychological Trauma: Theory, Research, Practice, and Policy, 1,* 130–145. http://dx.doi.org/10.1037/a0016211

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